V. *An Account, or Hiſtory, of the Procuring the* SMALL POX *by Inciſion, or Inoculation; as it has for ſome time been practiſed at* Conſtantinople.

Being the Extract of a Letter from Emanuel Timonius, Oxon. & Patav. M. D. S. R. S. *dated at* Conſtantinople, December, 1713.

Communicated to the Royal Society *by* John Woodward, M. D. Profeſ. Med. Greſh. *and* S. R. S.

THE Writer of this ingenious Diſcourſe obſerves, in the firſt place, that the *Circaſſians, Georgians,* and other *Aſiaticks,* have introduc'd this Practice of procuring the *Small-Pox* by a ſort of Inoculation, for about the ſpace of forty Years, among the *Turks* and others at *Conſtantinople.*

That altho' at firſt the more prudent were very cautious in the uſe of this Practice; yet the happy Succeſs it has been found to have in thouſands of Subjects for theſe eight Years paſt, has now put it out of all ſuſpicion and doubt; ſince the Operation having been perform'd on Perſons of all Ages, Sexes, and different Temperaments, and even in the worſt Conſtitution of the Air, yet none have been found to die of the *Small-Pox*; when at the ſame time it was very mortal when it ſeized the Patient the common way, of which half the affected dy'd. This he atteſts upon his own Obſervation.

Next he obſerves, they that have this Inoculation practiſed upon them, are ſubject to very ſlight Symptoms, ſome being ſcarce ſenſible they are ill or ſick; and what

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is valued by the Fair, it never leaves any Scars or Pits in the Face.

The Method of the Operation is thus. Choice being made of a proper Contagion, the Matter of the Puſtules is to be communicated to the Perſon propoſed to take the Infection; whence it has, metaphorically, the name of Inſition or Inoculation. For this purpoſe they make choice of ſome Boy, or young Lad, of a ſound healthy Temperament, that is ſeized with the common *Small-Pox* (of the diſtinct, not Flux ſort) on the twelfth or thirteenth day from the beginning of his Sickneſs; they with a Needle prick the Tubercles (chiefly thoſe on the Shins and Hams) and preſs out the Matter coming from them into ſome convenient Veſſel of Glaſs, or the like, to receive it; it is convenient to waſh and clean the Veſſel firſt with warm Water: A convenient quantity of this Matter being thus collected, is to be ſtop'd cloſe, and kept warm in the Boſom of the Perſon that carries it, and, as ſoon as may be, brought to the place of the expecting future Patient.

The Patient therefore being in a warm Chamber, the Operator is to make ſeveral little Wounds with a Needle, in one, two or more places of the Skin, till ſome drops of Blood follow, and immediately drop out ſome drops of the Matter in the Glaſs, and mix it well with the Blood iſſuing out; one drop of the Matter is ſufficient for each place prick'd. Theſe Punctures are made indifferently in any of the fleſhy Parts, but ſucceed beſt in the Muſcles of the Arm or *Radius*. The Needle is to be a three-edg'd Surgeon's Needle; it may likewiſe be perform'd with a Lancet: The cuſtom is to run the Needle tranſverſe, and rip up the Skin a little, that there may be a convenient dividing of the Part, and the mixing of the Matter with the Blood more eaſily perform'd; which is done, either with a blunt Stile, or an Ear-picker: The Wound is cover'd with half a Walnut-ſhell, or the like Concave Veſſel, and bound over, that the Matter be not rub'd off by the Garments; which is all

removed in a few Hours. The Patient is to take care of his Diet. In this place the Cuſtom is to abſtain wholly from Fleſh and Broath or 20 or 25 days.

This Operation is perform'd, either in the beginning of the Winter, or in the Spring.

Some, for caution, order the Matter to be brought from the Sick by a third Perſon, leſt any Infection ſhould be convey'd by the Cloaths of the Operator; but this is not material.

As to the Proceſs of this Matter, in reſpect of the *Idioſyncraſie*; the *Small-Pox* begins to appear ſooner in ſome than in others, in ſome with greater, in others with leſſer Symptoms; but with happy Succeſs in all. In this Place the Efflorescence commonly begins at the end of the ſeventh day, which ſeems to favour the Doctrin of *Criſes*.

It was obſerv'd, in a Year when the common *Small-Pox* was very mortal, that thoſe by Inciſion were alſo attended with greater Symptoms. Of 50 Perſons, who had the Inciſion made upon them almoſt in the ſame day, four were found in whom the Eruption was too ſudden, the Tubercles more, and Symptoms worſe. There was ſome ſuſpicion, that theſe four had caught the common *Small Pox* before the Inciſion was made. It is enough for our preſent purpoſe, that there was not one but recovered after the Inciſion: In thoſe four the *Small-Pox* came near the confluent ſort. At other times the inoculated are diſtinct, few and ſcatter'd; commonly 10 or 20 break out; here and there one has but 2 or 3, few have 100: There are ſome in whom no Puſtule riſes, but in the Places where the Inciſion was made, which ſwell up into purulent Tubercles; yet theſe have never had the *Small-Pox* afterwards in their whole Lives; tho' they have cohabited with Perſons having it.

It is to be noted, that a no ſmall quantity of Matter runs for ſeveral days, from the place of the Inciſion.

The Pocks ariſing from this Operation are dry'd up in a ſhort time, and fall off, partly in thin Skins, and partly con-

contrary to the common ſort, vaniſh by an inſenſible waſting.

The Matter is hardly a thick *Pus*, as in the common, but a thinner kind of *Sanies*; whence they rarely pit, except at the place of the Inciſion, where the Cicatrices left are not to be worn out by time, and whoſe Matter comes near the nature of *Pus*.

If an Apoſteme breaks out in any (which Infants are moſt ſubject to) yet there is nothing to be fear'd, for it is ſafely heal'd by Suppuration. If any other Symptom happens, 'tis eaſily cur'd by the common Remedies.

Obſerve, they ſcarce ever make uſe of the Matter of the Inciſious Pox for a new Inciſion. If this Inoculation be made on Perſons who have before had the *Small-Pox*, they find no alteration, and the places prick'd preſently dry up; except in an ill Habit of Body, where poſſibly a ſlight Inflammation and Exulceration may happen for a few days.

To this time, he ſays, I have known but one Boy, on whom the Operation was perform'd, and yet he had not the *Small-Pox*, but without any miſchief; and ſome Months after catching the common ſort, he did very well, It is to be obſerv'd, that the places of the Inciſion did not ſwell. I ſuſpect this Child prevented the inſertion of the Matter, for he ſtrugled very much under the Operation, and there wanted help to hold him ſtill. The Matter to be inſerted will keep in the Glaſs very well for 12 Hours. He goes on.

I have never obſerv'd any miſchievous Accident from this Inciſion hitherto; and altho' ſuch Reports have been ſometimes ſpread among the Vulgar, yet having gone on purpoſe to the Houſes whence ſuch Rumors have ariſen, I have found the whole to be abſolutely falſe.

It is now eight Years ſince I have been an Eye-witneſs of theſe Operations; and to give a greater Proof of the Sedulity I have uſed in this Diſquiſition, I ſhall relate two Hiſtories.

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There was, in a certain Family, a Boy of 3 Years old, afflicted with the *Falling-Sickneſs*, the *King's-Evil*, an *Hereditary Pox*, and a long *Maraſmus*. The Parents were deſirous to have the Inciſion made upon him; the *Small-Pox* were thrown off with eaſe; about the 40th day he dy'd of his *Maraſme*. In another Family, a Girl of 3 Years old, troubled with the like Fits, ſtrumous, attended with an *Hereditary Lues*, and labouring under a colliquative Looſneſs for three Months. The Operation was perform'd on this Child; ſhe came off very well of the *Small-Pox*, which was all over the 15th day; on the 32d ſhe dy'd of her Looſneſs, which had never left her the whole time.

But it is true, I never maintain'd the Inoculation as a *Panacæa*, or Cure for all Diſeaſes; nor do I think it proper to be attempted on Perſons like to die. Some more quick-ſighted, imagin'd theſe two Children were, as uſeleſs Shades, ſent to *Charon* by any means that could be made uſe of. If I could have collected any more concerning this Matter, I ſhould have imparted it candidly.

The reſt of Dr. *Timone's* Letter contains his Reaſons for this Method of Practice; which being the *Ætiological* Part, is publiſh'd in his own Words, as follows.

ÆTIOLOGIA.

CONtagium Variolarum per puris infuſionem propagari haud equidem mirabitur qui Æſculapii templum vel à primo limine ſalutavit, & fermentationis doctrinam ſubodoratus eſt: Nec obſcurior eſt inſitionis modus, qudm panificium, aut ars cereviſiaria, in quibus ex admixto fermento maſſæ fermentandæ turgeſcunt; conciliato nimirum motu inteſtino minimarum particularum principiis active pollentium. Si quis quærit interim cur variolæ periculoſæ alioquin & perſæpe lethales, ex inſitione ſine ullo periculo excludantur. Dico: Variolæ communes vel concurrente pravâ aliquâ ſpeciali aeris diatheſi ſuſcitantur, vel ab effluviis à variolo ſo

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corpore emanantibus per contagium propagantur. Primus caſus in paucis individuis accidit, & concurrente quidem vel inſigni cacochymia, vel ſaltem varioloſi ſeminii in talibus individuis latitantis acerrimâ exaltatione: Secundus caſus communiſſimus eſt. In primo caſu miaſma malignum aereum, in ſecundo virulenta contagii corpuſcula indolis (probabiliter) ſalino-ſulphureæ ſed ſpecificam fracedinem ſeu rancíditatem nacta ſtatim ac per reſpirationem hauriuntur ſpiritus ipſos, & labe quidem teterrima inficiunt; ſubſequenter autem maſſam ſanguineam & lympham vitiari manifeſtum eſt. Spiritus ſtatim infici rationi conſentaneum eſt, tum quia in fontes ſpirituum, cor ſcilicet & cerebrum, ſtatim ingreſſum habent virulentem aporriæ, tum ratione analogiſmi inter miaſmata & effluvia iſta ipſoſque ſpiritus, cum utraque ſpirituoſo-aereæ texturæ ſint. Deducitur etiam cita & prava ſpirituum infectio à tot tantiſque norvoſi ſyſtematis ſymptomatibuſque, quæ malas plerumque comitantur variolas, & præcipuè à convulſionibus epilepticis quæ infantibus accidunt ipſo momento, quo varioloſo inficiuntur contagio multo antequam febris illos corripiat. Maſſam autem ſanguineam inquinari præter febrem purulenta tuberculorum excluſio teſtatur. Lymphæ verò vitiatæ fidem faciunt glandularum in faucibus tumor, ſcreatus, & enormis multoties ptyaliſmus. Inter hæc circularis etiam ſequitur noxa. Sed præcipuè ſanguinis particulæ ab indebita ſpirituum irradiatione in plures ataxias & anomalias perducuntur. Duobus tamen potiſſimum modis in variolis communibus mortem contingere obſervavi.

Primus eſt quando paucis erumpentibus variolis, & tardè ad maturitatem procedentibus, mala alia oboriuntur ſymptomata; ſecundus quando nimia tuberculorum copia cadaveroſam putredinem inaucit. In primo caſu malignæ vulgo dicuntur variolæ: cauſa autem eſt vel nimia fuſio & diſſolutio maſſæ ſanguineæ, vel ejuſdem coagulatio & grumeſcentia. Si enim impetus ſpirituum exploſivus juſto plus augeatur, particulæ maſſæ ſanguineæ nimium ad invicem atteruntur, comminuuntur, & tenuiſſimas nanciſcuntur acrotitas: ſanguis in hoc ſtatu ſollertis naturæ mechaniſmum eludit, cumque nil fœculentioris in glandulis ſecretoriis cribriſque deponat, œconomiæ animalis functionibus requiſitas filtrationes & tranſcolati-

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ones celebrari haud patitur: improportionata etenim eſt figura particularum liquidi ad configurationem pororum in tubulis & colatoriis ratione ſubtilitatis nimiæ: filtratione enim defæcarentur particulæ ſanguinis ſi naturalem ſervarent ſchematiſmum & molem: hinc dicitur pepſim fieri per incraſſationem. Præter hoc celeritas ipſa tranſitûs ſanguinis in cauſa eſt ut nihil deponatur in colatoriis. Torrens ubi nimio impetu & præcipiti curſu fertur aquas turbidas defæcari haud patitur; quia vis centripeta gravitatem admixti terrei ſequens ſuperatur à fortiorum pulſoria virtute aqueorum globulorum rapide ruentium: virtus enim fortis, verbi gratia, ut unum non poterit lineam perpendicularem deſcribere ubi virtus fortis ut duo ad lineam horizontalem protrudit: ſic etiam haud pluit vento flante intenſiſſimo; eadem geometrica proportione (probabiliter loquendo) ſanguinis particulæ aucto ab effrænibus ſpiritibus motu, tubulos colatorios præterfluunt nullâ factâ fæcum depoſitione. Hæc probabilia fiunt à ſumma pulsûs celeritate, febre intenſiſſima, ſudore nullo, & urina cruda. E contra quandoque contingit ut ab acutis, & ſcindentibus deleterii fermenti particulis frangatur, corrodatur, vel ſaltem relaxetur elater ſpirituum: elangueſcente igitur ſpirituum motu torpidiores etiam hebetioreſque fiunt ſanguinis lymphæque particulæ: igitur dum in labyrinthæis tubulorum anfractibus moram indebitam contrahunt alias turmatim invicem complicari, alias autem, congeſtione factâ, ſuper alias incidere, & diverſo ad invicem ſuperficierum ſuarum contactu à naturali configuratione deſciſcere, & novas induere angulorum dimenſiones neceſſe eſt. Sic igitur diverſa ab illa, quam ſuperius narravimus, figurarum ad tubulorum meatus improportione, pari tamen calamitatis eventu dædaleæ naturæ machinationes irritas fieri contingit. Hæc probabilia fiunt à pulſu tardo & raro, ac febris carentia quandoque in ſumma malignitate obſervatis, paucis & tardè erumpentibus voriolarum puſtulis. Ulterius à trepidatoria, ſeu ſubſultoria ac tumultuoſa furentium ſpirituum irradiatione inæqualis eodem tempore in diverſis partibus maſſæ ſanguineæ, & arteriarum etiam venarumque contingere poteſt impulſus. Sive igitur fibrillæ aliquæ (ut quidem volunt) reperiantur in ſanguine, ſeu chili nondum bene aſſimilati ſint portiones uſibus peculiaribus dica-

dicatæ; probabiliter iſtarum motum turbari contingit: has enim in circulatorio motu ſecundum longitudinem ſuam naturaliter moveri neceſſe eſt: ab inæquali autem preſſione dicta rectilineam figuram perdere, & in ſpiras ac ſemicirculos criſpari coguntur: has igitur ſic contortas tranſverſaliter poſtmodum in circulatione raptari, ad invicem implicatas convolvi, &, ramoſis ſchematibus obortis, racematim adeo conglobari neceſſe eſt, ut in majuſculos tandem grumos coaleſcant, ſive demum fibrillæ illæ non dentur, certè cujuſcumque figuræ ſint maſſæ ſanguineæ particulæ, illas à naturali deſciſcere ſituatione ex hac motûs inæqualitate contingit: Confuſæ igitur particulæ iſtæ & ad invicem implicatæ ſtatim vehiculi ſui, ſeri ſcilicet globulis per expreſſionem à ſuo contubernio exploſis, majorem, ratione molis auctæ gravitatem nanciſcuntur, ideoque impulſivæ circulatoriæ facultatis vim ſuperant: Has igitur hîc illic reſtitare ac ſtagnare neceſſe eſt, prout in hoc vel illo loco prima mutua cohæſio forte contigerit: Hinc livida ſtigmata, & ſimul (quod ſæpe obſervavi in variolis cum petechiis erumpentibus) frequens ſequitur mictus, quo limpidiſſimum ſerum in magna copia excluditur. En fuſio, & coagulatio. Hinc mirum non eſt cur moriantur aliqui in variolis cum petechiis, convulſionibus ſyncope, vigiliis nimiis, emorrhegiis, delirio, vomitibus, enormibus, dyſenteriis,&c. quamvis haud multa puſtularum putrilagine perfundantur: In ſtygium enim veluti characteriſmum variolarum fermentum multoties evehitur, ita ut quamvis haud magnam craſſi puris copiam progignere aptum ſit, ſpiritibus tamen, liquidis & ſolidis ſuprarecenſita mala modis vel explicatis vel aliis conſimilibus communicare poſſit, ſicque mortem inferre; & hoc ante undecimum plerumque. Veniamus nunc ad ſecundum modum. Diverſa enim aliquando contingit pernicies & longè alterius generis tragœdia: quamvis enim abſint illa ſymptomata, nimia tamen puris, materiæ ſcilicet cadaveriſatæ, copia corpus obruitur. Pus autem generari probabile eſt quando ſulphureis oleoſiſque maſſæ ſanguineæ particulis in fracedine & fuſione conſtitutis acido-ſalinarum particularum coaffuſio contingit. Huic aſſerto facem accendunt innumera chymica experimenta quibus manifeſtè edocemur ſolutionibus pinguium ſulphureorum per alkalia factis acido quo-

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bet coaſſuſo ſtatim maſſam albicantis coloris emergere. Multoties igitur miaſma ſeu fermentum variolarum per reſpirationem hauſtum ratione indolis propriæ acerrimæ & fortaſſis ſepticæ tales in maſſam ſanguineam particularum acido-ſalinarum & oleoſo-ſulphurearum producere poteſt combinationes, ut non ſeminia ſolum variolarum, quæ omnibus individuis (mole tamen minima) à nativitate indita ſunt, agitentur, actuentur, & in purulentam abeant putrilaginem, ſed maſſa ipſa ſanguinea tota acorem contrahat, & motu quodam corruptorio putreſcat & cadaveriſetur. Sic igitur, incendio veluti cohorto, ulterius furere fermenteſcentes particulas contingit, quam varioloſis ſeminiis per deſpumationem eliminandis opus ſit: hic motus non eſt depuratorius heterogeneis ſecernendis inſerviens, ſed deſtructivus & corruptorius, fermento nempe maſſam totam ſuperante & invertente; fracidis ſcilicet rebellibuſque particulis victoria potitis, & omnes alias in ſua caſtra migrare cogentibus. Hoc manifeſtè obſervamus in variis potulentis, in quibus fermentatione aliquando excitatâ, motus ſuccedit corruptivus liquores totaliter vitians: hinc videmus aliquos quamvis ſuprarecenſitis ſymptomatibus immunes, immenſo tamen, ut ita dicam, putredinis oceano ſuffocatos: Et hoc periculum uſque ad vig ſimum ſecundum protrahitur. Ultimo loco conſiderandum ſolida etiam & nobiliores partes in hiſce caſibus peſſimè affici, & in ſpaſmos inordinatos fieri: variis horum diſtortionibus tubulorum meatus vitiari, at functionum munera depravari neceſſe eſt. Ecce igitur continentia, contenta, & impetum facientia, quorum triumviratu humani corporis reſpublica regitur, una eademque ruina ut plurimum involuta: mirabiturne quiſpiam malorum inde Iliadem in hominis perniciem pullulare? Obſervandum ulterius multis, qui peſte laboraverint, communibus variolis etiam poſt annum correptis bubones eoſdem intumuiſſe, qui antea in peſte eruperant: nonne hoc etiam ſummam malignitatem teſtatur. Inſitionem modo ad rationis trutinam revocemus. At hercule longe aliter in hoc contagionis modo rem procedere quis eſt qui non fateatur? Primum enim Spiritus nullatenus infici manifeſtum eſt: deinde non lymphæ, non ſanguini labes illa teterrima inuritnr, non ſolidis vitium aliquod communicatnr. Hinc ſymptomata omnia le-

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via, nulla peſſima, nulli infantibus epileptici inſultus. Contagionis enim hujuſce fermentum non ſpiritale, non aereum & acutum eſt, ſed humorale, iners, ac pigrum: venena autem quo ſubtiliora eo pejora: Ratione igitur improportionis nulla inter fermentum hoc & ſpiritus eſſe poterit lucta. Pus equidem variolarum in ipſa ſubſtantia ſanguini immediatè infuſum ſtatim in largum veluti pelagus exceptum diluitur, involvitur, abſorbetur, obtunditur: ſic illud miteſcit, ſic in manſuetiorem indolem cicuratur. Contagioſæ iſtæ particulæ ſanguinem ingreſſæ ſtatim ſibi congeneres varioloſi ſeminii particulas ſanguini à nativitate inditas inveniunt; iis igitur confermenteſcunt, ſed invicem combinatæ ac complexæ haud amplius ſui juris ſunt ut ulteriores excitent turbas, regiam vitæ petant, ſpirituum theſauros diripiant; nam mutuis compedibus conſtrictæ fixantur, præcipitantur, craſſioreſque & hebetiores fiunt, quam antea fuerint. Statim igitur volubilioribus aquearum particularum globulis tamquam aptis vehiculis ſuperincumbentes, ſanguinis motu à centro ad peripheriam tendente, ſecundo veluti amne, ad ambitum corporis protruduntur, eliminantur. Nonne manifeſtè videmus haud pus generari in inſititiis variolis, ſed ſanioſam, dilutiorem videlicet aqueamque magis materiam? Nonne ex hoc phænomeno palam eſt acido-ſalinas fermenti contagioſi particulas haud oleoſas paſſim ſanguinis particulas in cadaveroſam purulentiam pervertere, ſed blandioribus potius lævioribuſque aqueis particulis eaſdem dilutas & ſaturatas foras aſportari? Ex negatione fovearum & cicatricum nonne manifeſtum eſt acres, aculeatas, pungentes & corroſivas ſalini fermenti particulas à balſamicis ſtatim ſanguinis globulis obtundi, ſpiculis ſuis orbari, & hebetiori figura modificatas, vi veluti mochlica, extra propelli? Integra interim ſervatur maſſæ ſanguineæ textura, inviolata conſiſtentia. Nullam hîc vides fuſionem, nullam grumeſcentiam, nullum corruptorium aut deſtructivum motum. In inſitione enim tantum ſolummodo ſanguis fermenteſcit, quantum impuro à puri conſortio ſeparando, ac per deſpumationem extrudendo ſatis eſt. In hoc fermentationis motu ſolum per undulationem quandam leviter aliquando afficiuntur ſpiritus, lympha, & ſolidæ partes, & ſiquæ ad iſta

contagii particulæ perveniunt, certè (quod inſitionis adumbrat metaphora) non niſi ſylveſtri acrimonia privatæ, ac veluti dulcificatæ pervenire poſſunt. Hæc tenuitatis meæ ſatis conſcius haud præfricta fronte obtrudo: non me latet longè meliora emanatura ab illis, queis meliore luto finxit præcordia Titan: In hiſtorica tamen inſitionis hujuſce narratione aliquatenus me bene meritum ſpero.

Conſtantinopoli, Anno 1713. *Menſe Decembre.*

Emanuel Timonius, Conſtantinopolitanus. In Univerſitatibus Oxonienſi & Patavina Philoſophiæ & Medicinæ Doctor.

VI. *Theoremata quædam infinitam Materiæ Diviſibilitatem ſpectantia, quæ ejuſdem raritatem & tenuem compoſitionem demonſtrant, quorum ope plurimæ in Phyſica tolluntur difficultates.*

A Johanne Keill, *M. D. Profeſ. Aſtron. Savil. Oxon. & S. R. S.*

JAmdudum ſequentia *Theoremata* in lucem emiſi, omiſſis quidem *Demonſtrationibus*, eo quod arbitrabar eas, utpote non admodum involutas, à quovis in *Geometriâ*, vel etiam in *Arithmeticâ* mediocriter verſato, facile elici potuiſſe; Sed quoniam video, D. *Chriſtianum Wolfium* in *Academiâ Fredericianâ* Mathematum Profeſſorem, reliquoſque Actorum *Lipſienſium* Authores, hæc *Theoremata* non rectè intellexiſſe, cumque eorum in *Philoſophiâ* explicandâ uſus non ſit exiguus; libet ea nunc denuo, adjectis *Demonſtrationibus*, *Reipublicæ Philoſophicæ* impertiri.

Suppono *Materiam omnem diviſibilem eſſe in infinitum, eamq; poſſe formam quamcunque ſeu figuram induere, & ad quamcunque tenuitatem, ſeu craſſitiem quamcunque exiguam reduci.*

Lemma